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Claim Listing

1–8. (cancelled)

9. (new) A nip roll of a paper or board machine comprising a heatable roll manufactured of steel, having a thermal shock resistance greater than 6000 W/m^2, a tensile strength greater than 1000 MPa, an elongation at fracture greater than 7 %, a dynamic ductility greater than 20 J, and a surface hardness greater than 400 HV_{20}.

10. (new) The roll of claim 9 wherein the material of the roll is quenched and tempered steel.

11. (new) The roll of claim 10 wherein the tempered steel is at a basic hardness of about 250 HV_{20}.

12. (new) The roll of claim 10 wherein the tempered steel has a hardness in the quenched and tempered state which is greater than 400–500 HV_{20}.

13. (new) The roll of claim 9 wherein the roll has a surface which is hard coated to increase wear resistance.

14. (new) The roll of claim 9 wherein the roll has a surface which is heat treated by induction hardening to increase wear resistance.

15. (new) The roll of claim 9 wherein the roll has a shell which is made of at least two different materials.

16. (new) The roll of claim 9 further comprising a long nip calender formed with the roll.

17. (new) A calender comprising:

a first calendering element selected from the group consisting of: a shoe roll, and a belt/roll;

a backing roll having at least a first layer forming a backing roll surface, the first layer having a thickness, and the roll surface forming a long nip of greater than 30mm in length with the first calendering element;

a means for heating the backing roll surface to greater than 160° C;

a web in heat transfer relation to the backing roll surface;

wherein the the first layer forming a backing roll surface is homogeneous in a direction defined by the thickness of the first layer and is formed of steel in a quenched and tempered state, so that the hardness of said surface is greater than 400 HV_{20}, the first layer having a modulus of elasticity of greater than 200,000 MPa, a tensile strength of greater than 1,000 MPa, a bending fatigue strength greater than 350 MPa, a thermal conductivity of greater than 30W/mK, an elongation at fracture of greater than 7% and a dynamic ductility greater than 20 J.

18. (new) The calender of claim 17 wherein the first layer is formed of martensite or bainite.

19. (new) The calender of claim 17 wherein the backing roll is formed of the first layer enveloping an inner part of the backing roll.

20. (new) The calender of claim 17 wherein the backing roll surface is coated with a wear resistant material, whereby the surface hardness is increased.

21. (new) A method of calendering a web comprising the steps of:

forming a backing roll having at least a first layer, the first layer forming a backing roll surface, the first layer having a thickness, and the roll surface forming a long nip of greater than 30mm in length with a first calendering element, wherein the the first layer is homogeneous in a direction defined by the thickness of the first layer and is formed of steel in a quenched and tempered state, so that the hardness of the surface is greater than 400 HV_{20}, the first layer having a modulus of elasticity of greater than 200,000 MPa, a tensile strength of greater than 1,000 MPa, a bending fatigue strength greater than 350 MPa, a thermal conductivity of greater than 30W/mK, an elongation at fracture of greater than 7% and a dynamic ductility greater than 20 J;

heating the backing roll surface to greater than 160° C; and

passing a web through the long nip to produce a thermal shock of greater than 6,000 W/m^2 in the first layer of the backing roll.

22. The method of claim 21 wherein the backing roll is formed of the first layer enveloping an inner part of the backing roll.

23. The method of claim 21 wherein the backing roll surface is coated with a wear resistant material, increasing the surface hardness.